Chapter 4: Tissues, Part 1

Tissue = A collection of cells that perform related functions, and are similar in structure, or a mass of like cells

Histology = The study of tissues

The Four Primary Tissue Types

- Epithelial
- Connective
- Muscular
- Nervous

Developed by
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LAS POSITAS COLLEGE

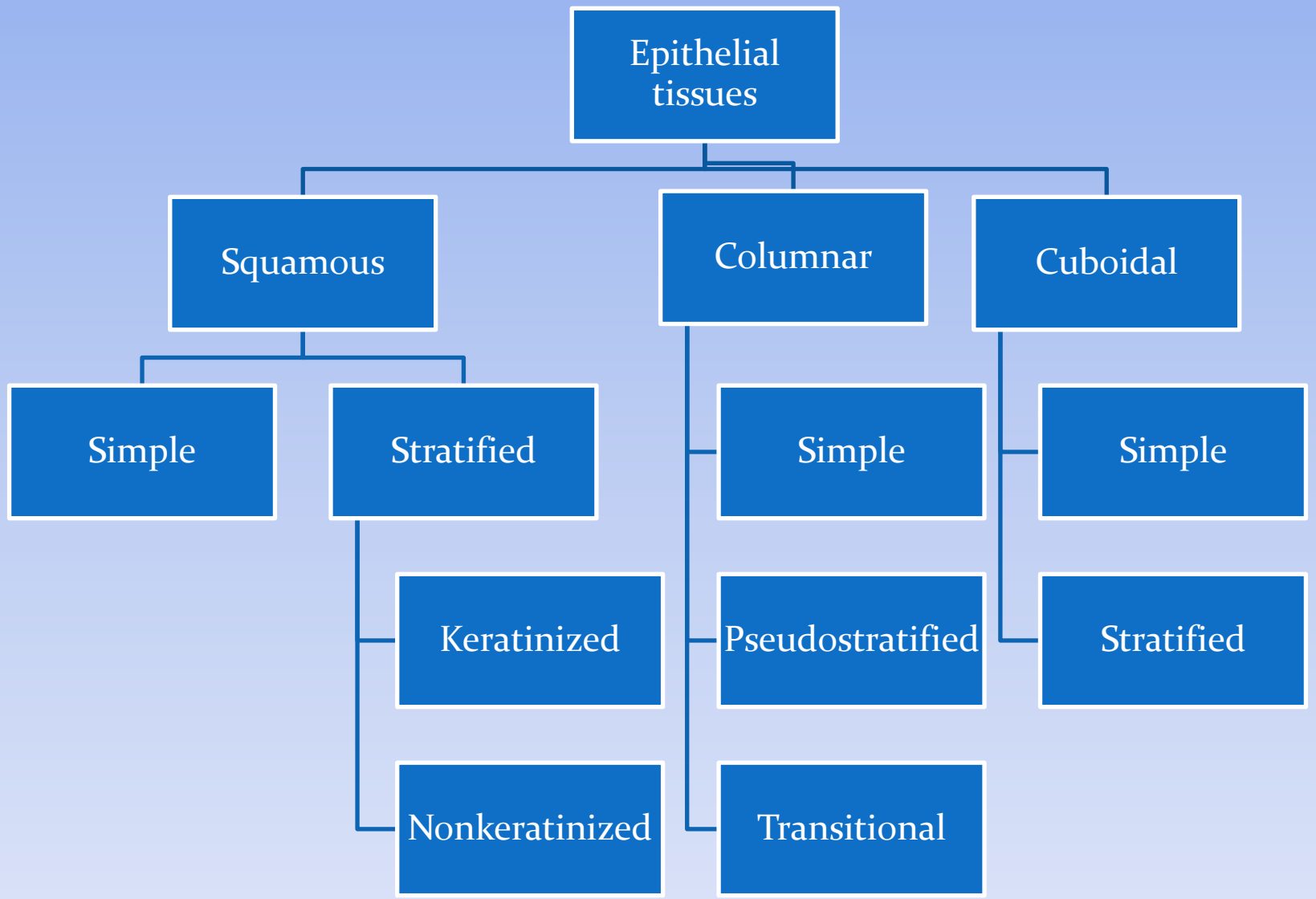
Epithelial Tissue

1. **Epithelium / -a = cell layer (barrier)**
   - **Epi = on or upon**
   - **Protection: covering or lining—inside and out**
   - **Permeability control: selective secretion and absorption**
   - **Sensation: touch receptors etc. and neuroepithelium of special senses**

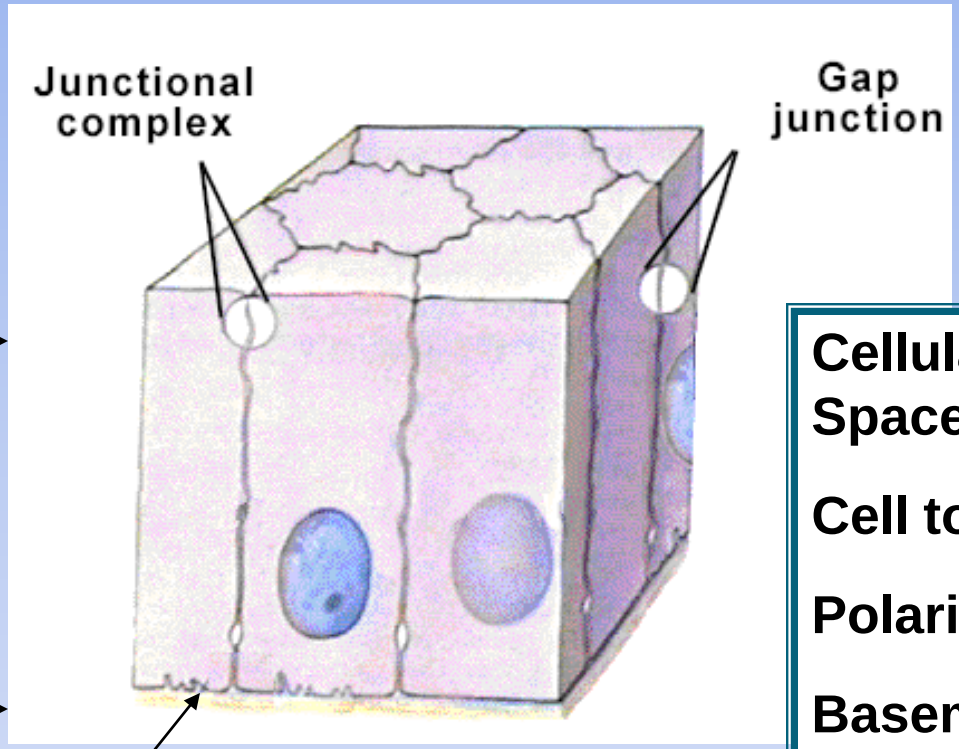
2. **Glands = secretory structure**
   - **Specialized secretions**
     - **Saliva, hormones, many others**

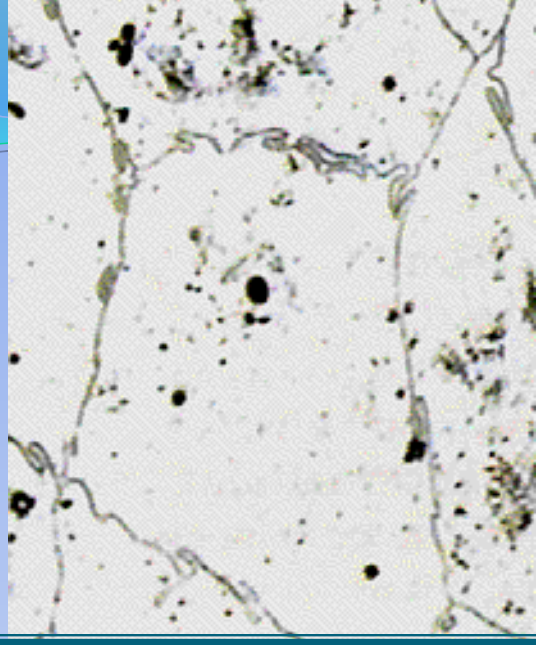
- ***The Four Primary Tissue Types***
  - **Epithelial**
  - **Connective**
  - **Muscular**
  - **Nervous**

A Concept Map



Structural Characteristics of Epithelia p 69





Cellularity (little to no IC Space)

Cell to cell contacts

Polarity (sometimes)

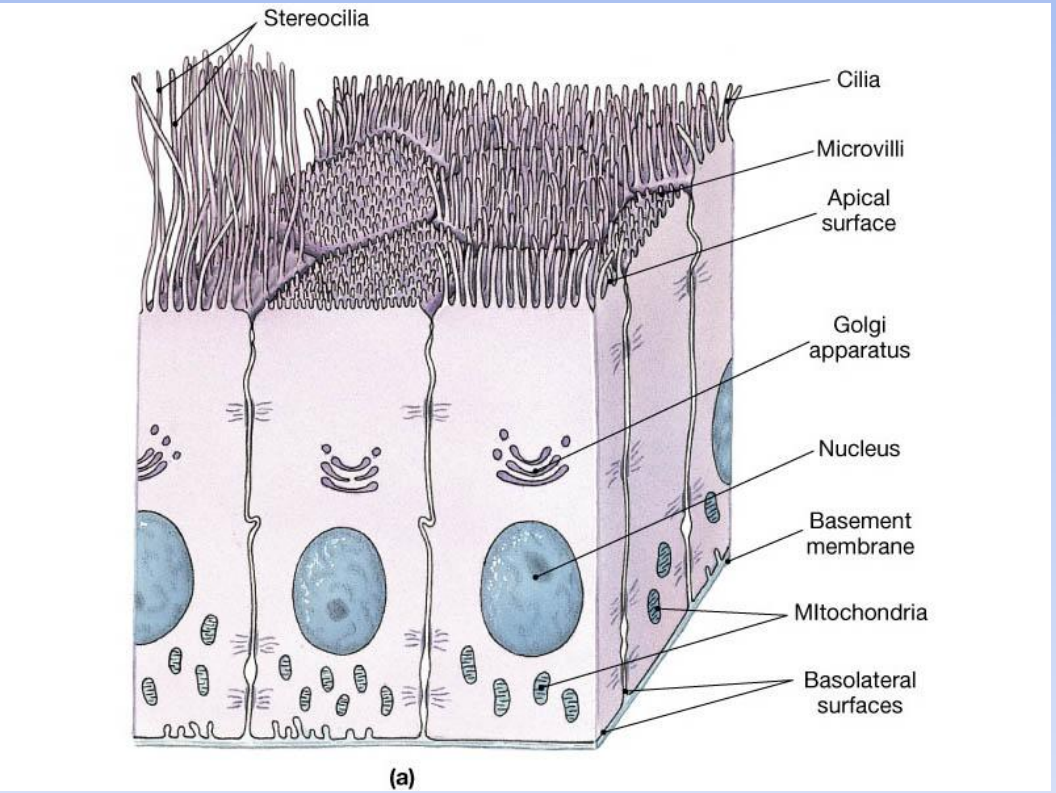
Basement Membrane

Support by connective tissue

<u>Avascular (esp. epidermis)</u>

Regeneration/repair

Polarity of (some) Epithelial Cells



Classification of Epithelia

The function of the epithelium determines which type.

Typically classified according to

1. **Number of cell layers**

Simple vs. Stratified

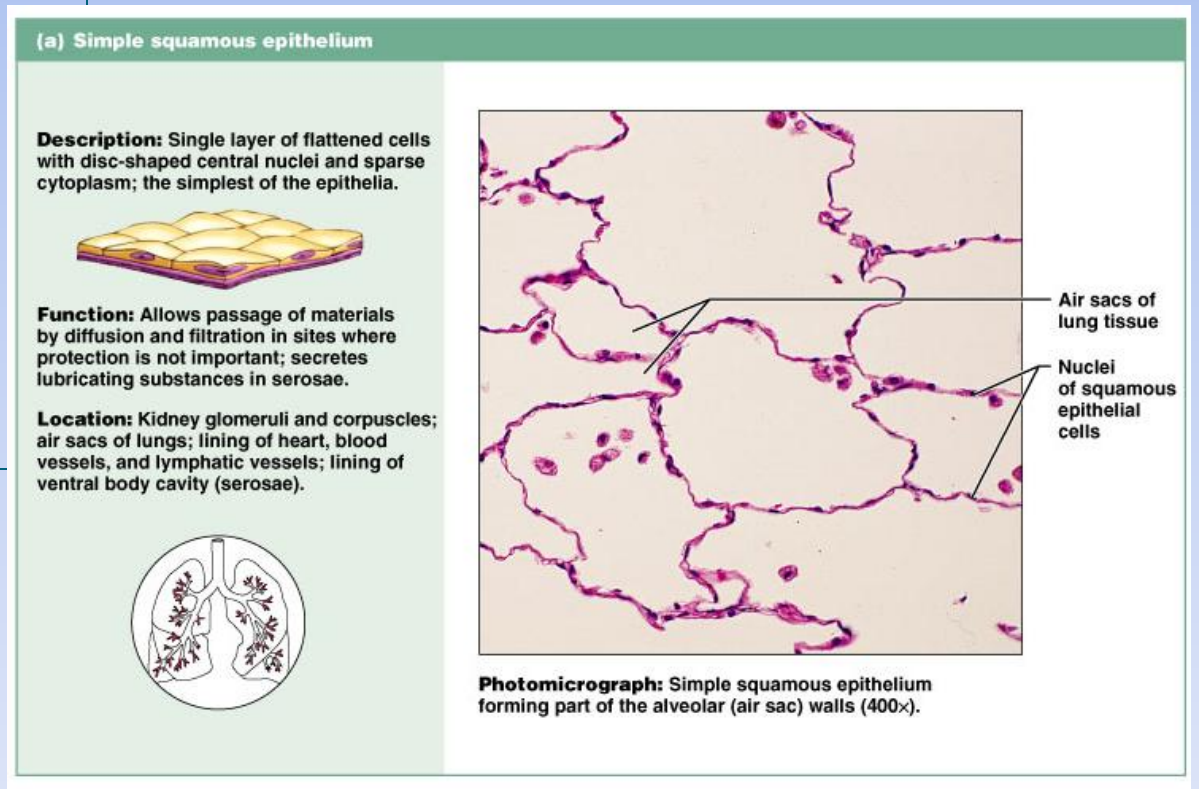
2. Shape of cell

Squamous, cuboidal, columnar

Simple Squamous Epithelium

Location:

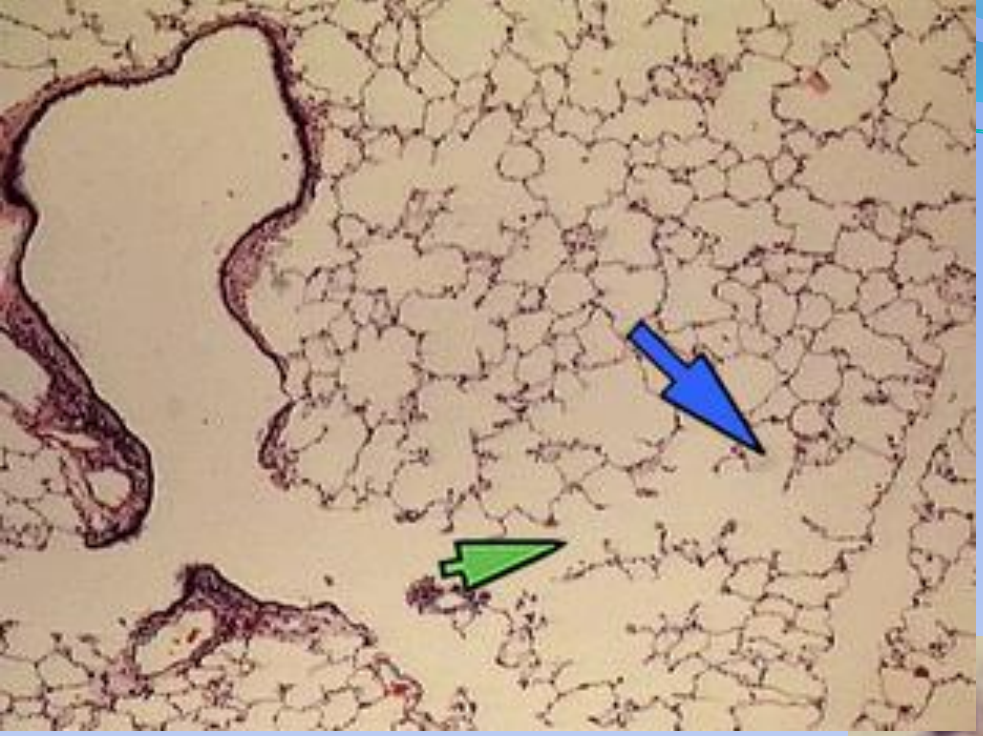
- **Lining of ventral body cavities, e.g. peritoneum**
- **Lining of blood vessels (endothelium)**
- **Alveoli of lung**
- **Bowman's Capsule**

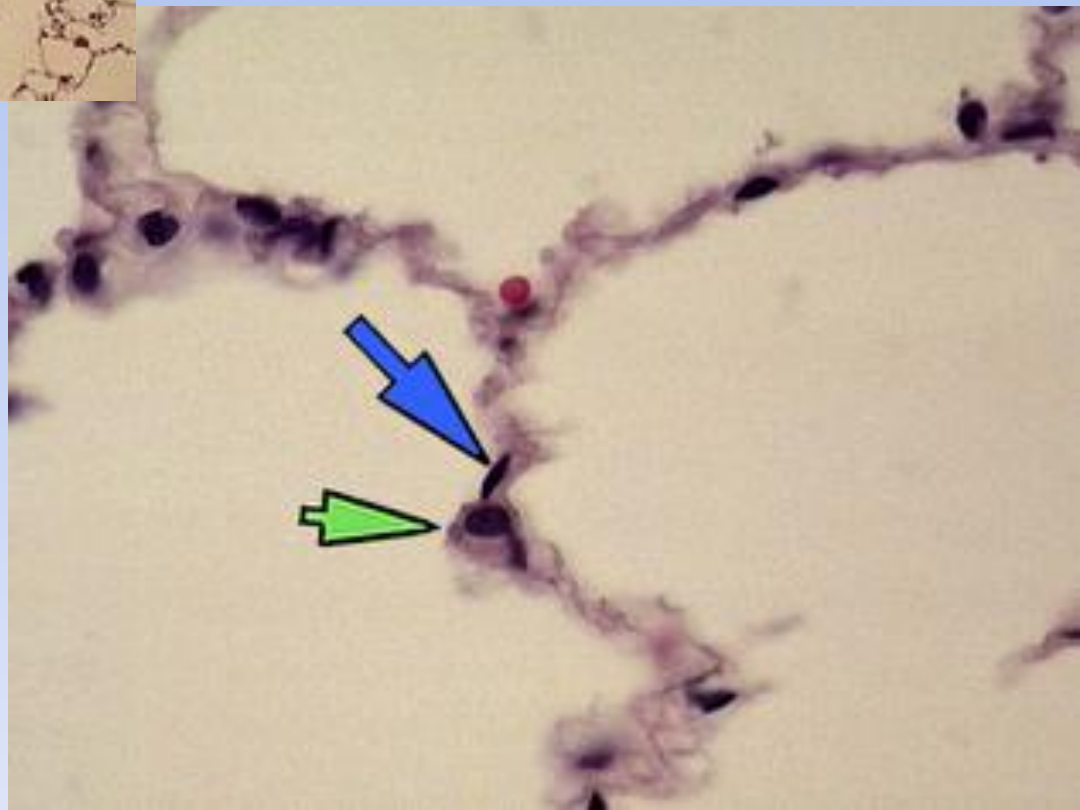

(a) Simple squamous epithelium
Description: Single layer of flattened cells with disc-shaped central nuclei and sparse cytoplasm; the simplest of the epithelia.
Function: Allows passage of materials by diffusion and filtration in sites where protection is not important; secretes lubricating substances in serosae.
Location: Kidney glomeruli and corpuscles; air sacs of lungs; lining of heart, blood vessels, and lymphatic vessels; lining of ventral body cavity (serosae).
Air sacs of lung tissue
Nuclei of squamous epithelial cells
Photomicrograph: Simple squamous epithelium forming part of the alveolar (air sac) walls (400×).

Function of Simple Squamous E.

- **Friction reduction (cavity lining)**
- **Blood vessel permeability control (capillaries and Bowman's capsule)**
- **Gas absorption and secretion (lung)**
- **<u>Not</u> protective—only one cell thick**

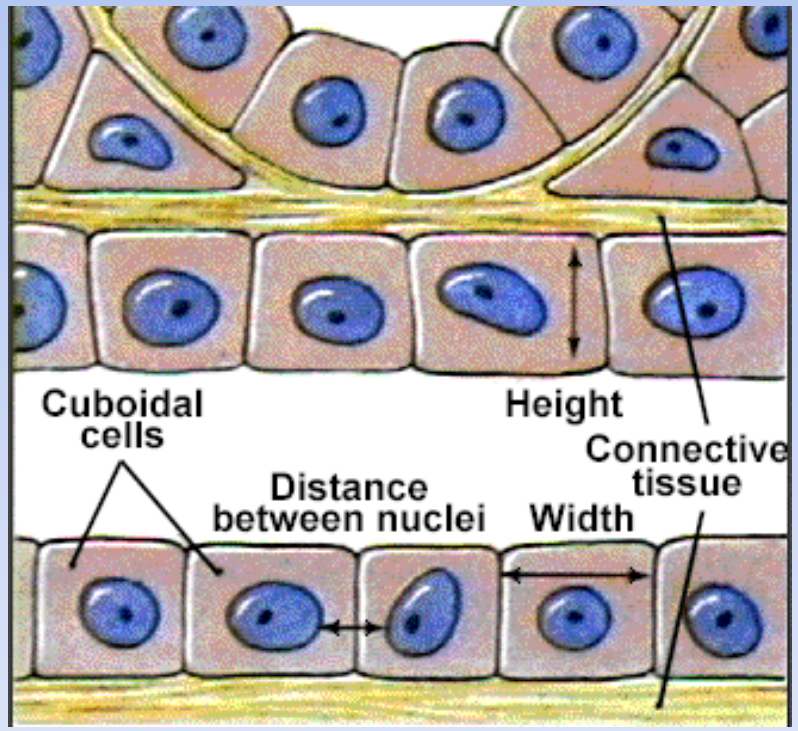
Lung

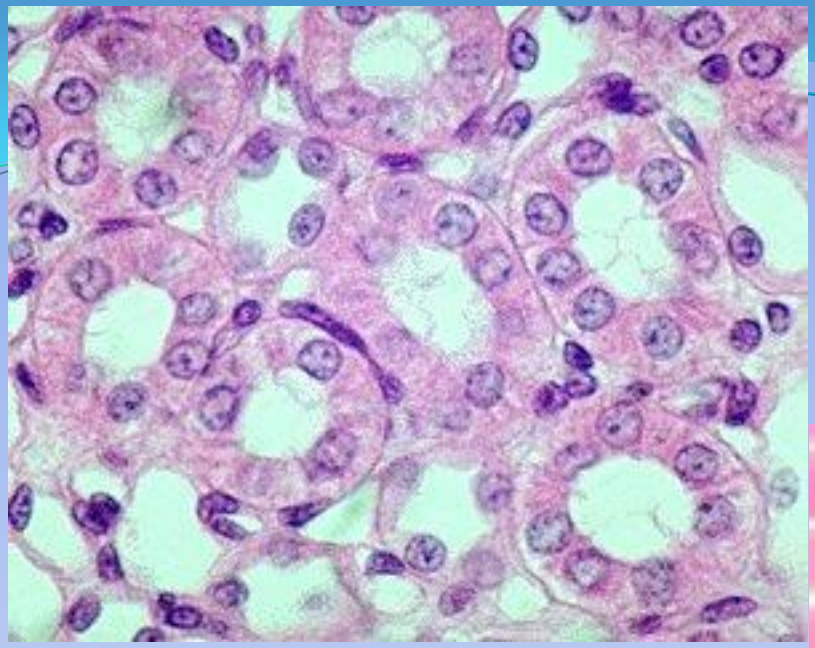




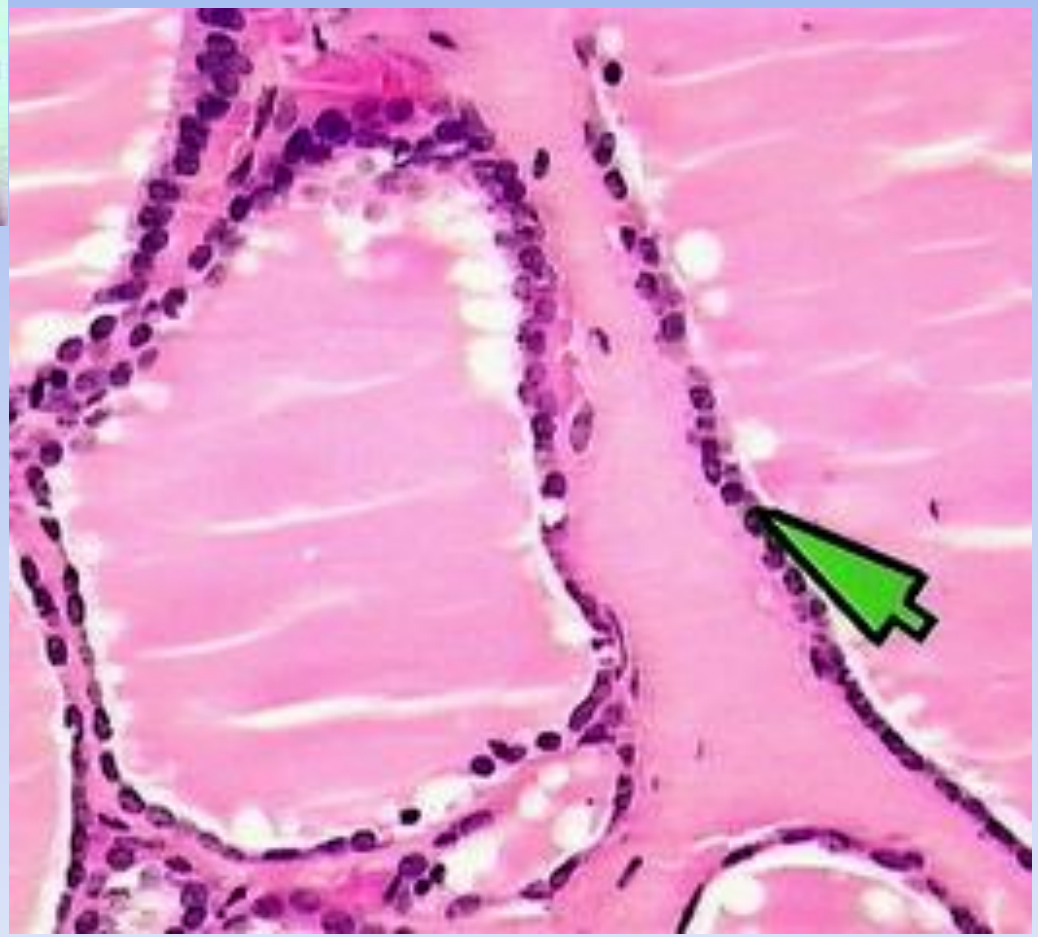
Simple Cuboidal Epithelium

- **Function:**
  - Secretion
  - Absorption
- **Location:** Lining of ducts
  - e.g., kidney tubules
  - Glands (salivary, pancreas, thyroid)





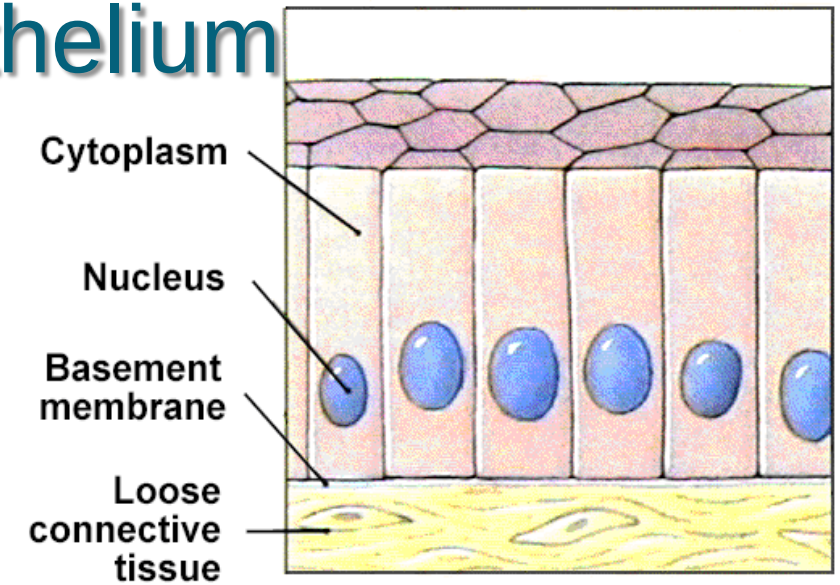
Kidney tubule



Thyroid Follicle

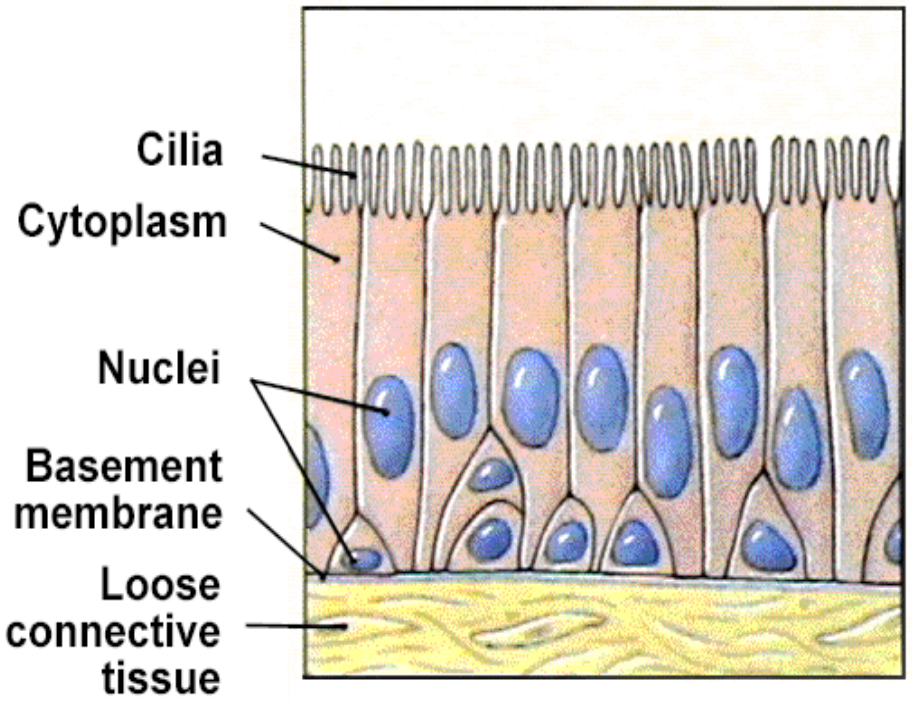
Simple Columnar Epithelium

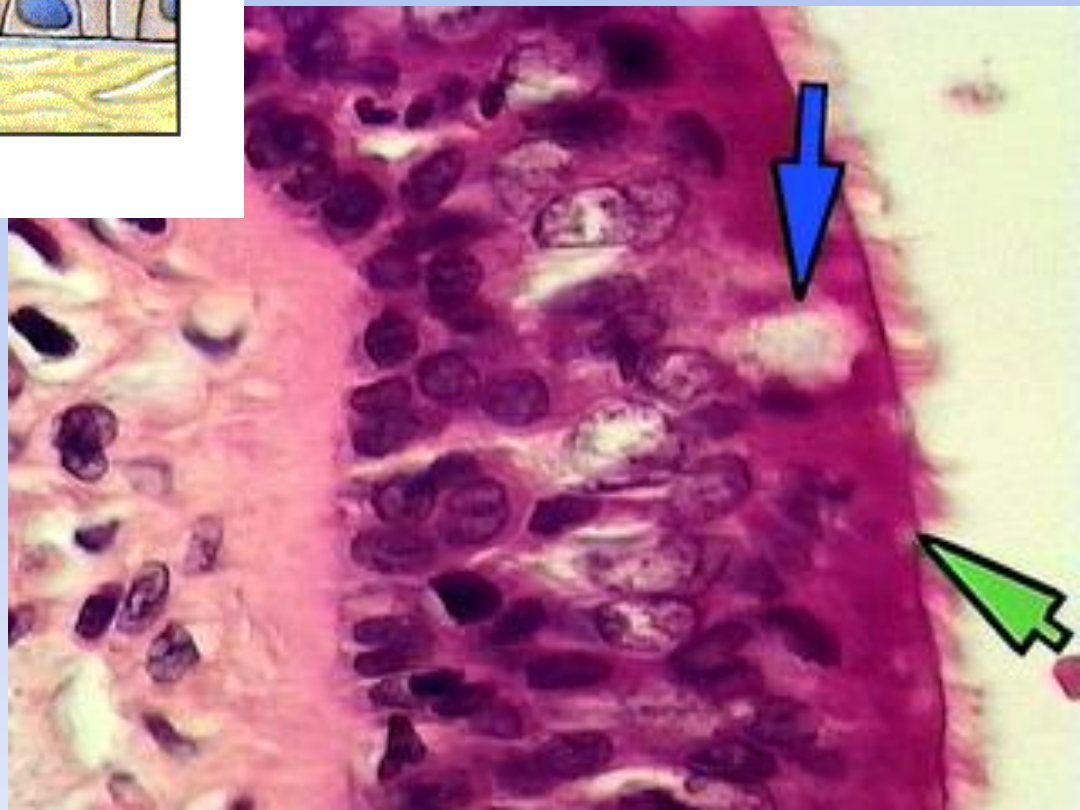
- **The “classic” epithelium**
- **Function:**
  - **Secretion**
  - **Absorption**
- **Location:**
  - **GI tract**
  - **Many excretory ducts**
- **Cilia (uterine tube)**
- **Microvilli (small intestine)**



Pseudostratified Ciliated Columnar Epithelium

- **Function:**
  Mucociliary Blanket
- **Mixture of cell types ⇒ nuclei located at various distances from surface. Yet: all cells contact BM**
- **Location:**
  Ducts of Respiratory tract
  - **i.e., trachea and bronchi**

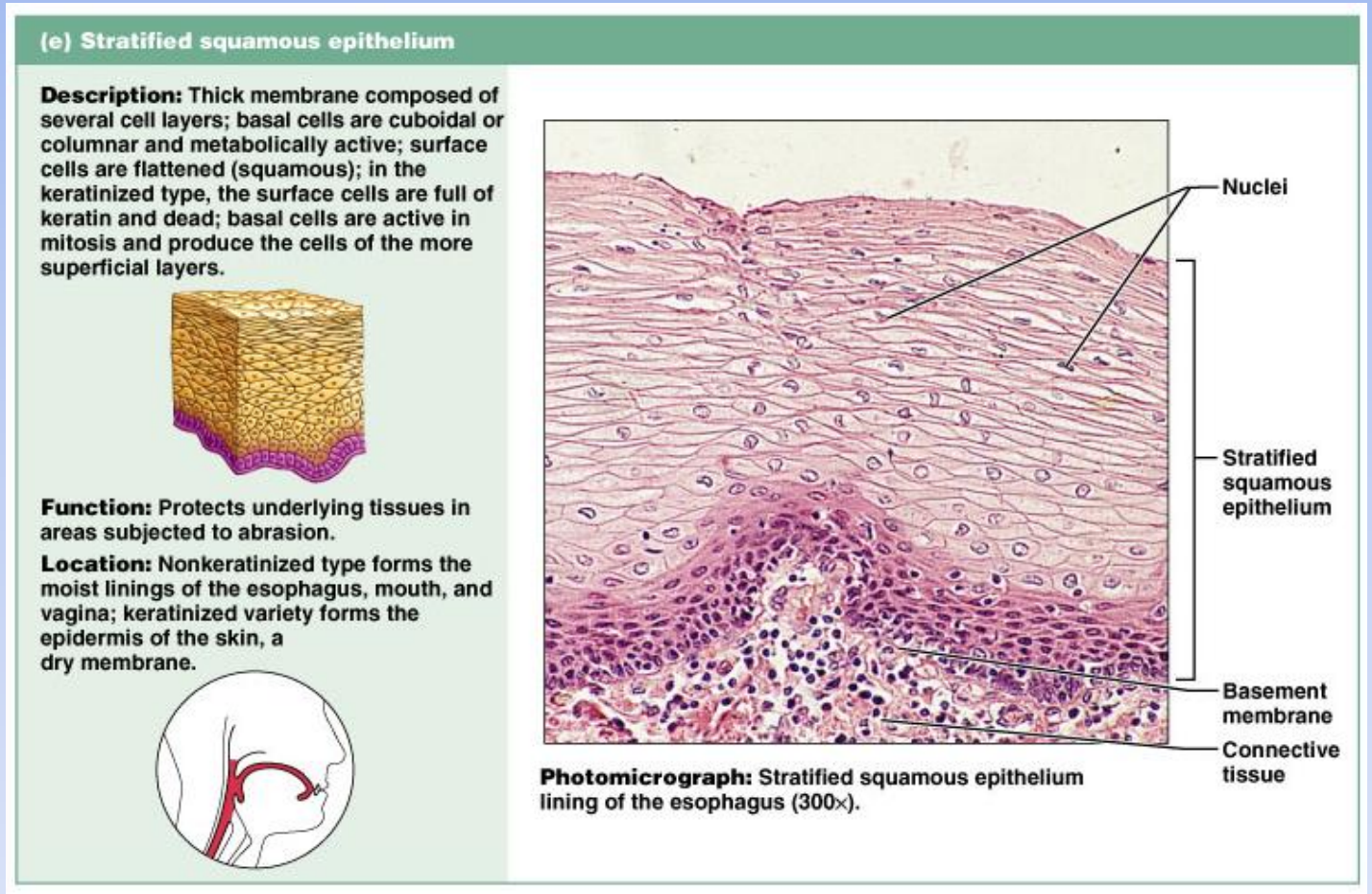

Cilia
Cytoplasm
Nuclei
Basement membrane
Loose connective tissue



Stratified Squamous Epithelium

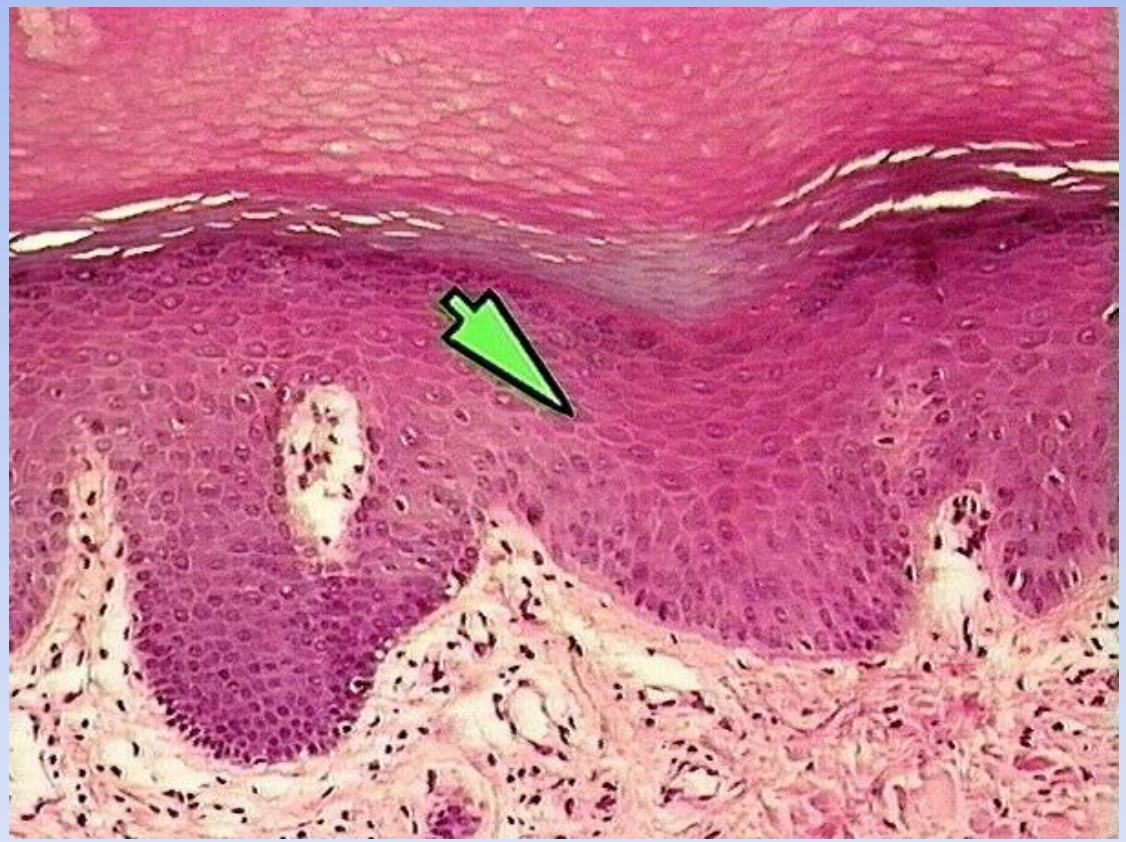
- **Function**
  Protection against abrasion, pathogens, chemicals, heat/cold…
- **Keratinized vs. non-keratinized**
- **Location ? Where we need protection!**
  Skin surface
  Entrances/exits of body, e.g. mouth, vagina

Nonkeratinized (noncornified) stratified squamous epithelium


(e) Stratified squamous epithelium
Description: Thick membrane composed of several cell layers; basal cells are cuboidal or columnar and metabolically active; surface cells are flattened (squamous); in the keratinized type, the surface cells are full of keratin and dead; basal cells are active in mitosis and produce the cells of the more superficial layers.
Function: Protects underlying tissues in areas subjected to abrasion.
Location: Nonkeratinized type forms the moist linings of the esophagus, mouth, and vagina; keratinized variety forms the epidermis of the skin, a dry membrane.
Nuclei
Stratified squamous epithelium
Basement membrane
Connective tissue
Photomicrograph: Stratified squamous epithelium lining of the esophagus (300×).

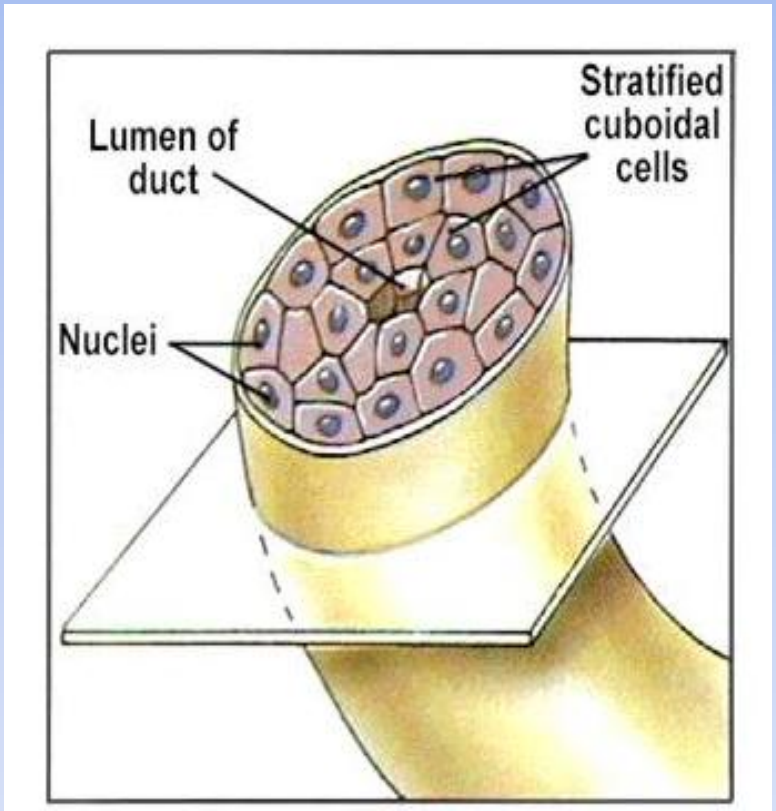
Keratinized (cornified) stratified squamous epithelium

Thick skin



Stratified cuboidal and stratified columnar: quite rare, found in glands and ducts

Sweat gland



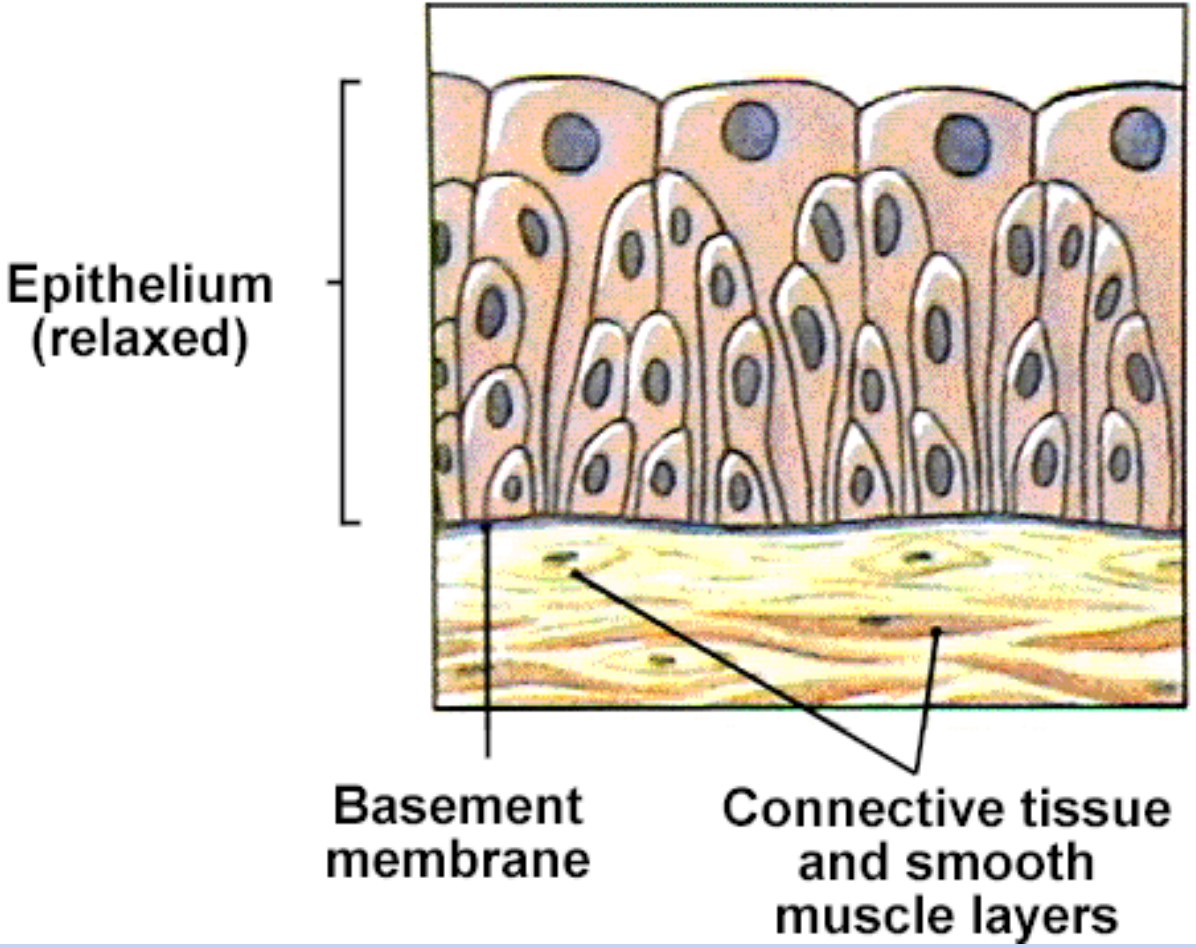
Transitional Epithelium

- **Function ?**

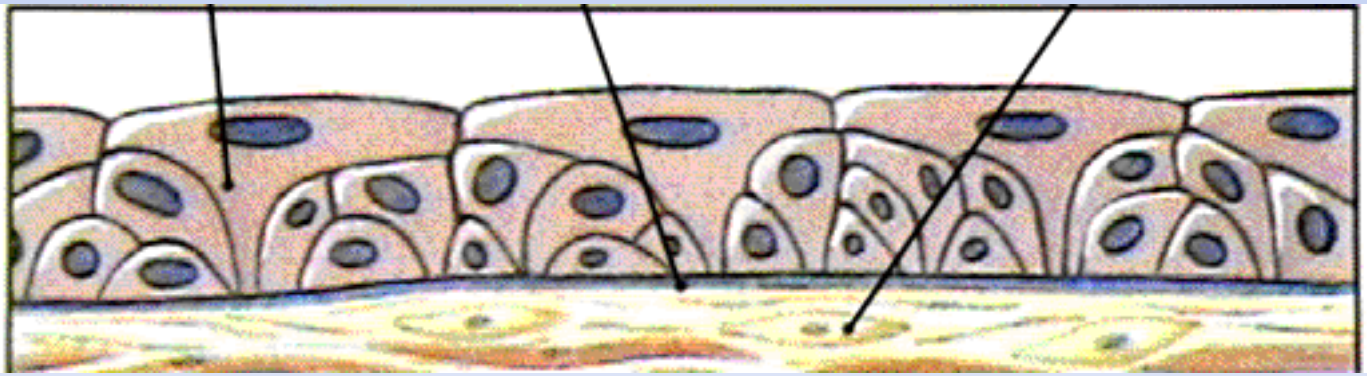
  Extreme expansion & recoil

- **Layered appearance due to overcrowding. All cells contact BM.**

- **Location ?**
  - **Bladder, ureters, renal pelvis**


Epithelium
(relaxed)
Basement
membrane
Connective tissue
and smooth
muscle layers

stretched



Bladder

Glandular Epithelia

Types of Glandular Secretions:

- **Exocrine**
- Glands have ducts
- Secretion to the "outside" of the body
- Simple or compound

- **Endocrine**
- Glands have no ducts
- Hormones (into the bloodstream)

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